

KHYBER PAKTHOON KHWA, PUBLIC SERVICE COMMISSION, PESHAWAR

SUBJECT:COMPETITIVE EXAMINATION FOR THE POSTS OF PROVINCIAL MANAGEMENT 2016
SERVICE(BPS-17)

PHYSICS PAPER-I**Time allowed: 03 hours****Max. Marks:100****Note: Attempt any FIVE complete questions.**

- Q.1. (a) What is the gradient of a scalar function? Derive an expression for $grad \phi$. (2,4)
- (b) Prove that the scalar quadruple product can be expressed as $(\vec{A} \times \vec{B}) \cdot (\vec{C} \times \vec{D}) = \begin{vmatrix} \vec{A} \cdot \vec{C} & \vec{A} \cdot \vec{D} \\ \vec{B} \cdot \vec{C} & \vec{B} \cdot \vec{D} \end{vmatrix}$ (10)
- (c) Show that the vectors $\vec{A} = \hat{i} + \hat{j} + 2\hat{k}$ and $\vec{B} = 2\hat{i} + 2\hat{j} + 4\hat{k}$ are parallel to each other. (4)
- Q.2. (a) Write a note on various law of conservations. (8)
- (b) Which law of conservation guides the balanced motion of a bicycle? (2)
- (c) If the potential energy of two particles $U = \frac{a}{(x_1 - x_2)^2} - b(x_1 - x_2)^2$. Show that they exerts equal and opposite force on each other. (10)
- Q.3. (a) A stick of length l is at rest in one system and oriented at an angle θ with respect to x-axis; What are the length and orientation angle of the stick as viewed by the observer moving with the speed v with respect to the first system. (12)
- (b) State Postulate of Special Theory of relativity. (4)
- (c) "There was a girl named Ms. Bright. She could travel faster than light. She went out one day in an Einsteinian way and came back the previous night." justify it. (4)
- Q.4. (a) How is the negative results of Michelson-Morley experiment interpreted according to Einstein theory of relativity. (12)
- (b) A wave has a speed of 243 m/s and a wavelength of 3.27cm. calculate The frequency and the period of the wave. (8)
- Q.5. (a) Viscosity is an example of a transport phenomenon. What property is being transported? Can you think of other transport phenomena and their corresponding properties? (6)
- (b) How much work is done by pressure in forcing 1.4 m³ of water through a 13-mm internal diameter pipe if the difference in pressure at the two ends of the pipe is 1.2 atm? (8)
- (c) Give a molecular explanation of why surface tension decreases with increasing temperature. (6)
- Q.6. (a) When two waves interfere, does one alter the progress of the other. (5)
- (b) Two waves of the same amplitude and frequency are travelling on the same string. At a certain instant the string looks like a straight line. Are the two waves necessarily travelling in the same direction? What is the phase relationship between the two waves? (10)
- (c) if two waves differ only in amplitude and are propagated in opposite directions through a medium, will they produce standing waves? Is energy transported? Are there any nodes? (5)
- Q.7. (a) List examples of Brownian motion in physical phenomena. (8)
- (b) Show that a volume per mole of a gas increases, the van der Waals equation tends to the equation of state of an ideal gas. (6)
- (c) State laws of thermodynamics. (6)
- Q.8. (a) Explain Maxwell distribution of molecular velocities. (7)
- (b) Discuss Fermi- Dirac statistics in detail. (7)
- (c) What is the significance of the Fermi energy in a fermion system at 0K? at $T > 0K$? (6)